

## EVALUATING THE EFFECT OF SIZE AT RELEASE ON RECAPTURE RATES OF JAPANESE SPANISH MACKEREL IN THE EASTERN SETO INLAND SEA, JAPAN

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The Japanese Spanish mackerel, *Scomberomorus niphonius*, is a large migratory fish that feeds on small fishes and is mainly distributed off the western coast of Japan. The species is an important fishery resource, especially in the Seto Inland Sea, with the fishery targeting adult fish migrating into the spawning grounds from the Kii Channel from April to June, and immature fish from September to November. The annual catch has decreased since 1986, when the highest catch of 6,255 tonnes was recorded. In 1998, the catch reached a historical minimum of 196 tonnes. To increase the commercial catch of this species, the National Center for Stock Enhancement has initiated a stocking program and since 1998, fishers have been prohibited from targeting young Spanish mackerel in autumn. In 2002, the Fisheries Agency of Japan began implementing a recovery plan for depleted resources and this species was accredited as the first target species for the program.

This study evaluated the stocking effectiveness of different sizes at release of Japanese Spanish mackerel in the Eastern Seto Inland Sea, based on recaptures of 0 and 1-year-old fish estimated through sampling surveys of commercial landings. Juveniles of about 40 mm and 100 mm in total length, marked with alizarin complexone, were released from early June to early July. The numbers of 40 mm and 100 mm fish released were 51,000 and 83,000 in 2002, and were 94,000 and 77,200 in 2003, respectively. To identify released fish, 2,761 individuals were sampled at the 14 main landing fish markets between 2002 and 2004, from September in the release year to June in the next year.

Recapture rates, contribution rates to commercial landings, and the economic efficiency of releases were estimated with standard errors (Table 1). The variance estimators were derived by assuming simple random sampling of the commercial landings. The ratio of the economic efficiency of the size at release was estimated at 4.17 and 1.98 for each release year, respectively. Releasing 100 mm juveniles reared in net cages was more efficient than direct releases of 40 mm juveniles.

Table 1. Estimates for recapture rates, contribution rates to the landings and economic efficiency, with standard errors in parentheses, based on recaptures of 0 and 1-year-old fish of released Japanese Spanish mackerel in the Eastern Seto Inland Sea, Japan

Year of release	Sample size	Size at release	Number of marked fish	Recapture		Recapture rate (%)	Yield per release (g/individual)	Contribution rate to the landings (%)	Amount of landings (yen)	Economic efficiency
				Weight (kg)	Number					
2002	1,766	40mm	8	471 (228)	421 (186)	0.8 (0.4)	9.2 (4.5)	0.39 (0.17)	381,466 (202,054)	0.13 (0.07)
		100mm	84	7,924 (1,006)	6,567 (801)	7.9 (1.0)	95.5 (12.1)	6.07 (0.74)	6,862,953 (901,893)	0.55 (0.07)
2003	995	40mm	81	4,661 (509)	3,293 (356)	3.5 (0.4)	49.6 (5.4)	7.95 (0.86)	3,945,790 (448,750)	0.74 (0.08)
		100mm	293	18,298 (889)	12,756 (616)	16.5 (0.8)	237.0 (11.5)	30.78 (1.49)	16,074,104 (798,486)	1.46 (0.07)